Title: What's In A Quilt?

Brief Overview:

In this unit the students will develop skills for solving patterns. They will be able to determine the cores, relationships, and rules of patterns. They will copy, continue, describe, and create patterns throughout the unit.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

Number and Operations

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
- Understand meanings of operations and how they relate to one another.

Algebra

- Understand patterns, relationships, and functions.
- Use mathematical models to represent and understand quantitative relationships.
- Analyze change in various contexts.

Geometry

- Use visualization, spatial reasoning, and geometric modeling to solve problems.
- Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

Data Analysis and Probability

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
- Select and use appropriate statistical methods to analyze data.

- **Process Standards**

Problem Solving

- Build mathematical knowledge through problem solving.
- Solve problems that arrive in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Monitor and reflect on the process of mathematical problem solving.

Reasoning and Proof

- Recognize reasoning and proof as fundamental aspects of mathematics.

Communication

- Organize and consolidate their mathematical thinking through communication.
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others.
- Analyze and evaluation mathematical thinking and strategies of others.
- Use the language of mathematics to express mathematical ideas precisely.

Connections

- Recognize and use connections among mathematical ideas.
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- Recognize and apply mathematics in contexts outside of mathematics.

Representation

- Create and use representations to organize, record, and communicate mathematical ideas.
- Select, apply, and translate among mathematical representations to solve problems.

Grade/Level:

3

Duration/Length:

Four days, 45 minutes per day

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Problem solving strategies
- Basic geometric shape and colors
- Recognizing patterns

Student Outcomes:

Students will:

- Identify patterns and pattern characteristics
- Extend and continue patterns
- Name pattern rules and relationships
- Use correct terminology to describe patterns
- Create and design a pattern
- Complete a T-table
- Complete line graph

.

Materials/Resources/Printed Materials:

- Pattern blocks
- Pattern stickers
- Sentence strips
- Student activity sheets
- Children's literature on quilts and patterns
- Masking tape
- Chart paper
- Transparencies
- Overhead projector

Development and Procedure:

Day 1

- Today, you will introduce the unit on patterns that the students will be working on over the next four days. Discuss patterns, (what are they, where have they seen them), and have visuals to help reinforce concepts.
- Place math vocabulary words on a chart and discuss: term, function, core, relationship, sequence, rule, pattern, pattern block shapes (square, triangle, tan rhombus, hexagon, parallelogram, trapezoid)
- Review definitions of math vocabulary words Teacher Resource Sheet #1
- Recall prior knowledge, have each student complete and label a pattern activity on Student Resource Sheet #1. Answer key can be found on Teacher Resource Sheet #2.
- Use the overhead to review and discuss student's response. Allow student volunteers to write their response on the overhead and discuss the labeling of the pattern.

- Ask questions: Was the pattern difficult to make? Why? Why not?
  What are the primary colors in your pattern?
  Explain why you labeled it AAB, etc.
  What pattern blocks did you use? (Name them)

- Read a children's literature book on quilts and patterns.

Cooperative Group Activity: Model activity first

- Have students work in cooperative groups of four to complete Student Resource Sheet #2.
- Each team will be working together to create a pattern using the directions that you have created on the cooperative learning sheets.
- Explain to students that there is four rules that each team will follow to complete the pattern. Each team member will be responsible for reading the rule to the team, and the team will work together to create the pattern. Possible answers are included on Teacher Resource Sheet #3.
- In groups, the students will use pattern blocks to design a pattern of their choice and display the design horizontally. Using the patterns, the students will create 4 directions.
- Each team member will write one direction. Each team will exchange their problem with another team.
- Allow students to move to the team that they exchanged with to determine if the other team could make the pattern.
- Use your teacher classroom observation sheet and teacher/student verbal interaction to check for concept understanding.

Day 2

- Reflect on previous lesson from day 1.
  Ask questions: What is a pattern? What is a term? How long does a pattern need to be? Why? How did you determine the directions for your team pattern? How did you solve the other team's problem for the pattern?
- Read a children's literature book on quilts and patterns.
- Place students in cooperative groups for today's activity.
- Tell the students that they will be working as a team to design a pattern for a quilt.
- Explain to the students that they will complete a compare and contrast activity with another group. Briefly model sample of comparing and contrasting using an orange and an apple. Draw an orange and an apple on a transparency sheet to view on the overhead projector. Say, when you compare and contrast, you want to find the likenesses and differences. Have students look at both fruits and ask students to identify what they see (orange and apple) Ask: What do you know about the orange and apple? (The orange and apple are both fruits) Ask: Are they alike or different? (Alike because they are fruits) agree. While the students are answering, start to compare and contrast by writing a paragraph under the drawing. Continue with questions to generate answers to determine the likenesses and differences.
- Distribute Student Resource Sheet #3, pattern blocks, and the sentence strips.
- After each team has completed its pattern strip, allow a team member to hang the pattern on the board to view for the compare and contrast activity. Sample responses can be found on Teacher Resource Sheet #3.

- Allow students time for a think, pair, share activity.
- Discuss some of the differences and likenesses in the patterns.
- Ask students to demonstrate evidence in the responses.
- Use teacher classroom observation sheet and teacher/student verbal interaction to check understanding of concept.

Day 3

Reflect on lesson from day 2

- Ask students to do a think, pair, share (TPS) activity about what they observed in the compare and contrast activity yesterday. Allow time for students' response.
- Read children's literature to demonstrate different types of quilts and patterns.
- Distribute sentence strips, pattern stickers and Student Resource Sheet #4.
- Explain to students that they will be working independently to respond to a prompt to create a pattern for a quilt.
- Read prompt to your students if necessary.
- **(Prompt): Your sister has asked you to help her make a quilt for your mother for her birthday. You know that your mother will be excited because she loves quilts. Since your sister is going to actually make the quilt, she wants you to create the design. You have chosen to create a pattern. Use pattern stickers to create a pattern for your quilt on the sentence strip. Be sure to use a pattern that you know your mother will love.**
- Students will reflect as they respond to questions about the quilt.
- Use this activity at your discretion (i.e., open discussion response or as an assessment). Sample responses can be found on Teacher Resource Sheet #5.
- Use teacher classroom observation sheet and teacher/student verbal interaction to check understanding of concept.

Extension/follow-up

- Explain to the students that they will be using a prompt involving patterns to complete a table. Model the table activity (Student Resource Sheet #5) to make sure students understand the relationship between patterns and tables. Model step by step (include highlighting important information to pull from the prompt).
- (Prompt): **Your mother wants to make a quilt. She wants to buy a variety of fabric strips to use when making her quilt. When she goes to the fabric store, she sees a beautiful quilt. In this quilt, each strip consists of 5 fabric squares. Your mother wants to make the same quilt. However, she only wants to use a total of 60 fabric squares in her quilt. How many fabric strips will your mother need to buy to make the same beautiful quilt that is in the store?**
- Distribute Student Resource Sheet #5 for students to complete as a model. An answer key may be found on Teacher Resource Sheet #6.
- Have students use the information from the table, to plot a graph to represent the data. When plotting a graph, be sure to demonstrate that the coordinates are plotted over and up. (Example, coordinates (1,5) to plot the 1, go over on the number of strips axis and to plot the 5, go up on the number of squares axis)
- Model a sample of plotting a graph for clarification (Teacher Resource Sheet #7).

- Tell students that they will also write a paragraph including mathematical terms to interpret the graph.
- Distribute Student Resource Sheet #6 for students to complete as a model.
- Tell students that they will now work independently to complete a table and plot a graph from the following prompt.
- **(Prompt): The students in Mrs. Stewart's class made a class quilt last week. The students loved making the quilt! Mrs. Stewart gave each student 7 fabric squares to attach to the quilt. If Mrs. Stewart had 12 students in her class, how many fabric squares were on the completed quilt.**
- Distribute Student Resource Sheets #7 and 8 for students to complete independently.
- Use teacher observation sheet and teacher/student verbal interaction to assess understanding of concept. An answer key can be found on Teacher Resource Sheets #8 and 9

Day 4

Performance Assessment:

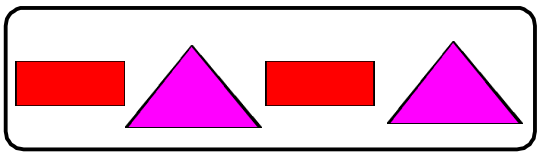
- Review and reflect on lessons 1, 2, and 3 to determine if students understand the concept of patterns.
- Ask high order questions to stimulate thinking (i.e., what method would you choose to help you better understand patterns? (manipulative, drawings,) What real life situations could you use to apply to what you know about patterns?
- Discuss and post rubric Student Resource Sheet #10
- Distribute Student Resource Sheet #9
- **(Assessment)**: **My grandmother bought an unfinished quilt on sale. The color pattern of the quilt began as red, yellow, blue, yellow, red, yellow, blue yellow, red, yellow, blue, yellow. Since the first color square of the quilt is red, my grandmother wants the last square to also be red. If she uses a total of 40 squares in her quilt, what will be the last color square?**
- Evaluation of the assessment will be determined by the rubric, Teacher Resource Sheet #10.

Authors:

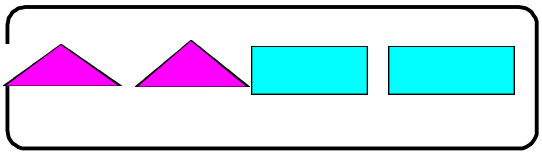
Jennifer Eaton
East Salisbury Elementary
Wicomico Co., MD

Alexinia Seldon
Maple Elementary
Dorchester Co., MD

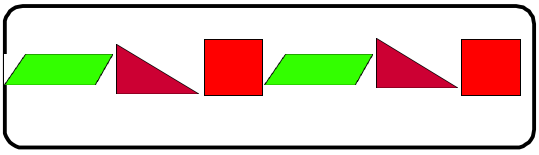
Continue the patterns. Label the pattern that is represented.



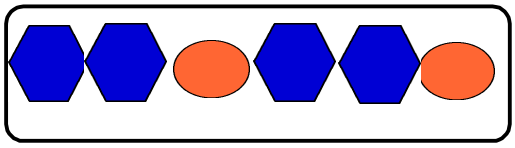
Core_____



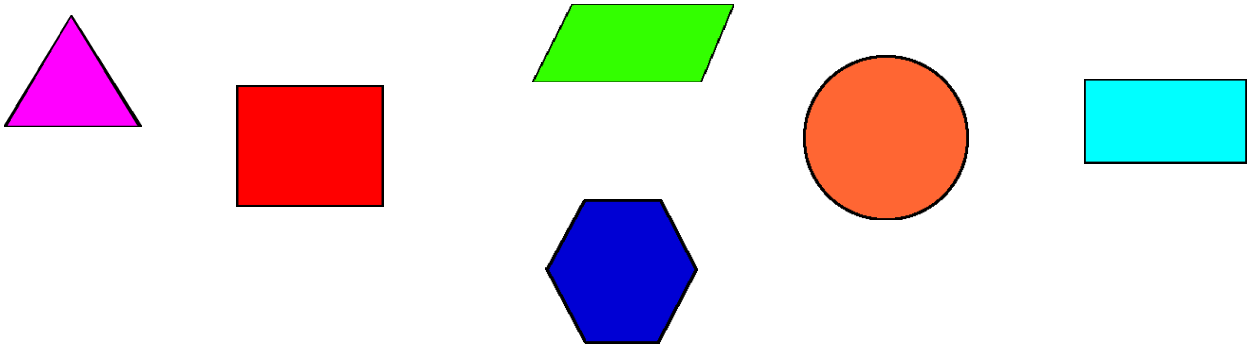
Core_____



Core_____



Core_____



Create a pattern in a horizontal line. Repeat the core three times.

Use three colors to make the pattern.

Do not use the rhombus in your pattern.

Be sure that there is a double shape in your pattern.

Name _____

Today, each group used a sentence strip to design a pattern for a quilt. Using your pattern, complete the following information.

I am in group_____.

My group designed a pattern that was an _____ pattern.

Compare and contrast your pattern with the pattern of another group. In your answer be sure to include the group that you are comparing and contrasting.

_____

_____

_____

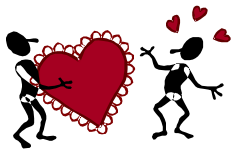
_____

_____

Name_____

Your sister has asked you to help her make a quilt for your mother for her birthday. You know that your mother will be excited because she loves quilts. Since your sister is going to actually make the quilt, she wants you to create the design. You have chosen to create a pattern.

Use pattern stickers to create a pattern for your quilt on the sentence strip. Be sure to use a pattern that you know your mother will love.



1. Explain the pattern that you created. Be sure to use mathematical vocabulary in your explanation.

_____

_____

_____

_____

2. Today we read a story about quilts. Were there any patterns from the quilts in the story that were similar to the pattern that you created for your quilt? Explain your reasoning.

_____

_____

_____

_____

Mother's Quilt

Your mother wants to make a quilt. She wants to buy a variety of fabric strips to use when making her quilt. When she goes to the fabric store, she sees a beautiful quilt. In this quilt, each strip consists of 5 fabric squares. Your mother wants to make the same quilt. However, she only wants to use a total of 60 fabric squares in her quilt. How many fabric strips will your mother need to buy to make the same beautiful quilt that is in the store?

Number of Strips	Number of Squares
1	5
2	10
3	15

Using your information from the table, plot the ordered pairs to represent your data.

Write a few sentences describing the pattern of your graph. Be sure to use mathematical vocabulary in your answer.

_____

_____

_____

_____

Quilt Making

The students in Mrs. Stewart's class made a class quilt last week. They loved making the quilt! Mrs. Stewart gave each student 7 fabric squares to attach to the quilt. If Mrs. Stewart had 12 students in her class, how many fabric squares were on the completed quilt?

Number of Students	Number of Squares
1	7
3	21
5	35
7	49

Using your information for the table, plot the ordered pairs to represent your data.

Write a few sentences describing the pattern of your graph. Be sure to use mathematical vocabulary in your answer.

Name_____

Unfinished Quilt

My grandmother bought an unfinished quilt on sale at the mall. The color pattern of the quilt was red, yellow, blue, yellow, red, yellow, blue, yellow, red, yellow, blue, yellow. Since the first color square of the quilt is red, my grandmother wants the last square to also be red. If she uses a total of 40 squares in her quilt, what will be the last color square?

_____
_____
_____
_____
_____
_____
_____

Rubric

3	The response shows a clear understanding of the pattern. It uses mathematical vocabulary to support the answer.
2	The response shows a vague understanding of the pattern. It uses some supporting evidence and mathematical terms.
1	The response does not show an understanding of the pattern. No supporting evidence or mathematical terms are used.
0	The response does not relate to the question.


What's In A Quilt?




Vocabulary For Pattern Unit

Core – The core is the shortest string of elements that repeat in a pattern.

Function – When you have a set of ordered pairs, for every first number (input) there is only one second number (output).

Pattern – A pattern is a sequence of numbers, colors, objects, etc. that repeat.

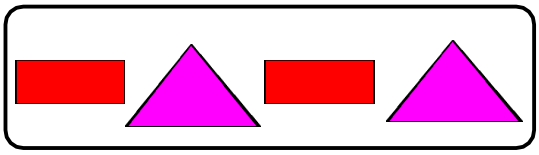
Relationship – The description of how two numbers relate to each other.

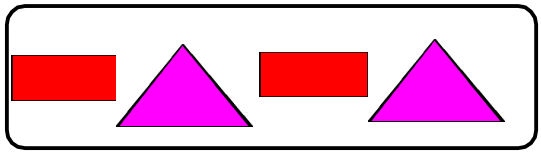
Rule – A description of the pattern.

Sequence – A set that is arranged in a specific order.

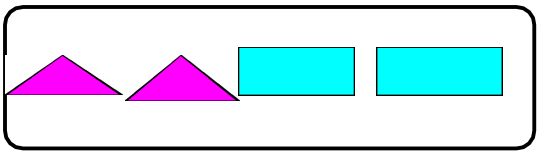
Term – One number, color, or object in sequence.

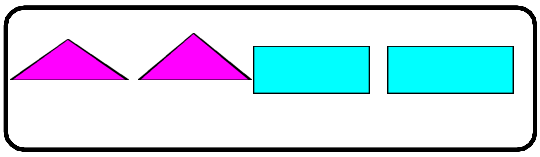
Continue the patterns. Label the pattern that is represented.



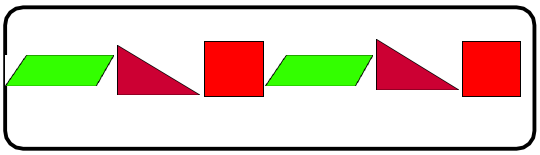


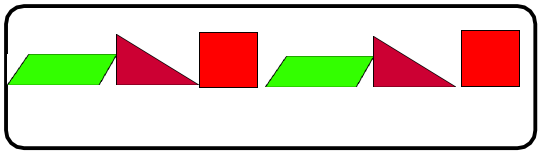
Core AB



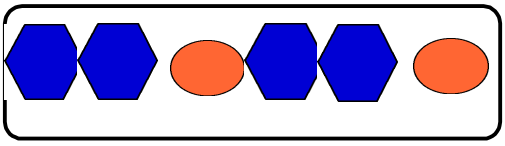


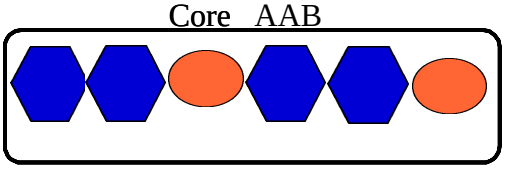
Core AABB



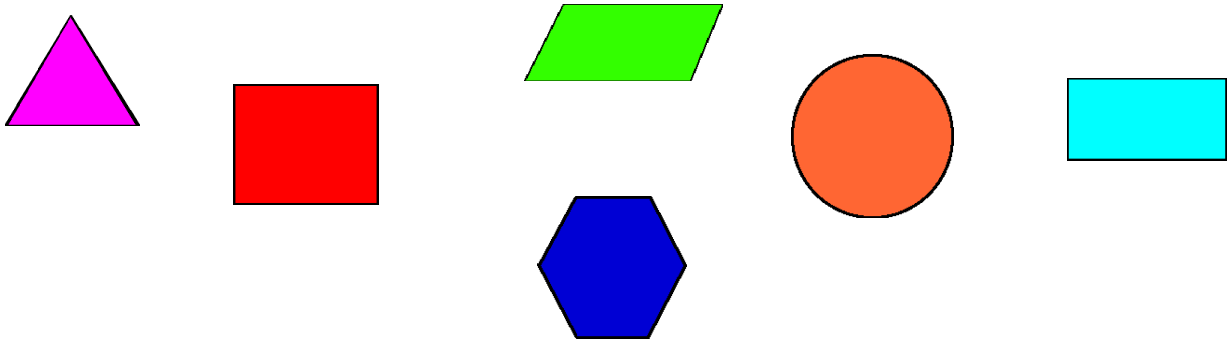


Core ABC





Core AAB



Sample Patterns For Student Resource 2

Sample 1

Orange Square, Orange Square, Green Triangle, Yellow Hexagon, Orange Square, Orange Square

Green Triangle, Yellow Hexagon, Orange Square, Orange Square, Green Triangle, Yellow Hexagon

Sample 2

Red Trapezoid, Blue Parallelogram, Green Triangle, Green Triangle, Red Trapezoid

Blue Parallelogram, Green Triangle, Green Triangle, Red Trapezoid, Blue Parallelogram

Green Triangle, Green Triangle

Sample 3

Green Triangle, Orange Square, Orange Square, Yellow Hexagon, Green Triangle, Orange Square

Orange Square, Yellow Hexagon, Green Triangle, Orange Square, Orange Square, Yellow Hexagon

Sample Response For Student Resource 3

Group 2's Design

Orange Square	Tan Rhombus	Orange Square	Tan Rhombus	Orange Square	Tan Rhombus

Group 4's Design

Orange Square	Orange Square	Green Triangle	Green Triangle	Orange Square	Orange Square
Green Triangle	Green Triangle	Orange Square	Orange Square	Green Triangle	Green Triangle

I am in group 2.

My group designed a pattern that was an AB pattern.

Compare and contrast your pattern with the pattern of another group. In your answer be sure to include the group that you are comparing and contrasting.

Today, I made a pattern with my group. My group's pattern is similar and different from group 4's pattern in many ways. One way that our patterns are alike is that both patterns begin with the orange square. Another way is that both patterns use two different colors. One way that our patterns are different is that my group designed an AB pattern and group 4 designed an AABB pattern. Also, my group used the tan rhombus in our design and group 4 did not.

Sample Response For Student Resource 4

Your sister has asked you to help her make a quilt for you mother for her birthday. You know that your mother will be excited because she loves quilts. Since your sister is going to actually make the quilt, she wants you to create the design. You have chosen to create a pattern.

Use pattern stickers to create a pattern for you quilt on the sentence strip. Be sure to use a pattern that you know your mother will love.

Pattern

Yellow Hexagon	Red Trapezoid	Green Triangle	Yellow Hexagon	Red Trapezoid	Green Triangle

Yellow Hexagon	Red Trapezoid	Green Triangle

1. **Explain the pattern that you created. Be sure to use mathematical terms in your explanation.**

I created an ABC pattern. In my pattern I used three different shapes. The shapes that I chose were a yellow hexagon, red trapezoid, and green triangle. I repeated my pattern three terms.

2. **Today we read a story about quilts. Were there any patterns from the quilts in the story that were similar to pattern that you created for your quilt? Explain your reasoning.**

There were no patterns from the story that were similar to my pattern. I designed an ABC pattern. All of the patterns from the story were either AB patterns or AABB patterns.

Mother's Quilt

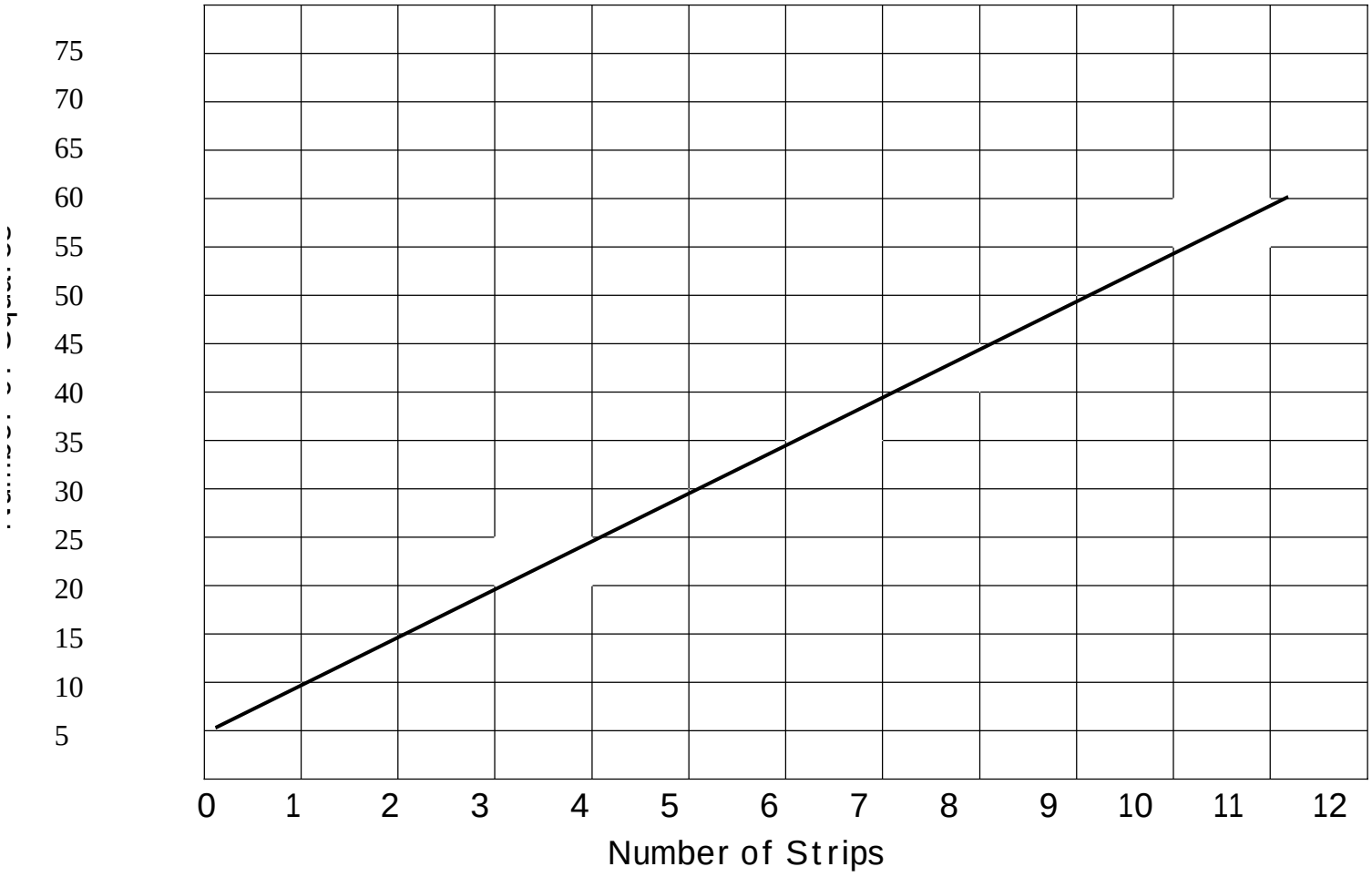
Your mother wants to make a quilt. She wants to buy a variety of fabric strips to use when making her quilt. When she goes to the fabric store, she sees a beautiful quilt. In this quilt, each strip consists of 5 fabric squares. Your mother wants to make the same quilt. However, she only wants to use a total of 60 fabric squares in her quilt. How many fabric strips will your mother need to buy to make the same beautiful quilt that is in the store?

Number of Strips	Number of Squares
1	5
2	10
3	15
4	20
5	25
6	30
7	35
8	40
9	45
10	50
11	55
12	60

My mother will need to buy 12 strips to make the same beautiful quilt that is in the fabric store.

Using your information from the table, plot the ordered pairs to represent your data.

Beautiful Quilt



Write a few sentences describing the pattern of your graph. Be sure to use mathematical vocabulary in your answer.

Today, I used the table to plot the coordinates on a line graph. The line on the graph is diagonal. I know that if my mother decided to make a quilt of 65 fabric squares, she would need to buy 13 strips. I was able to determine this information by following the diagonal pattern.

Quilt Making

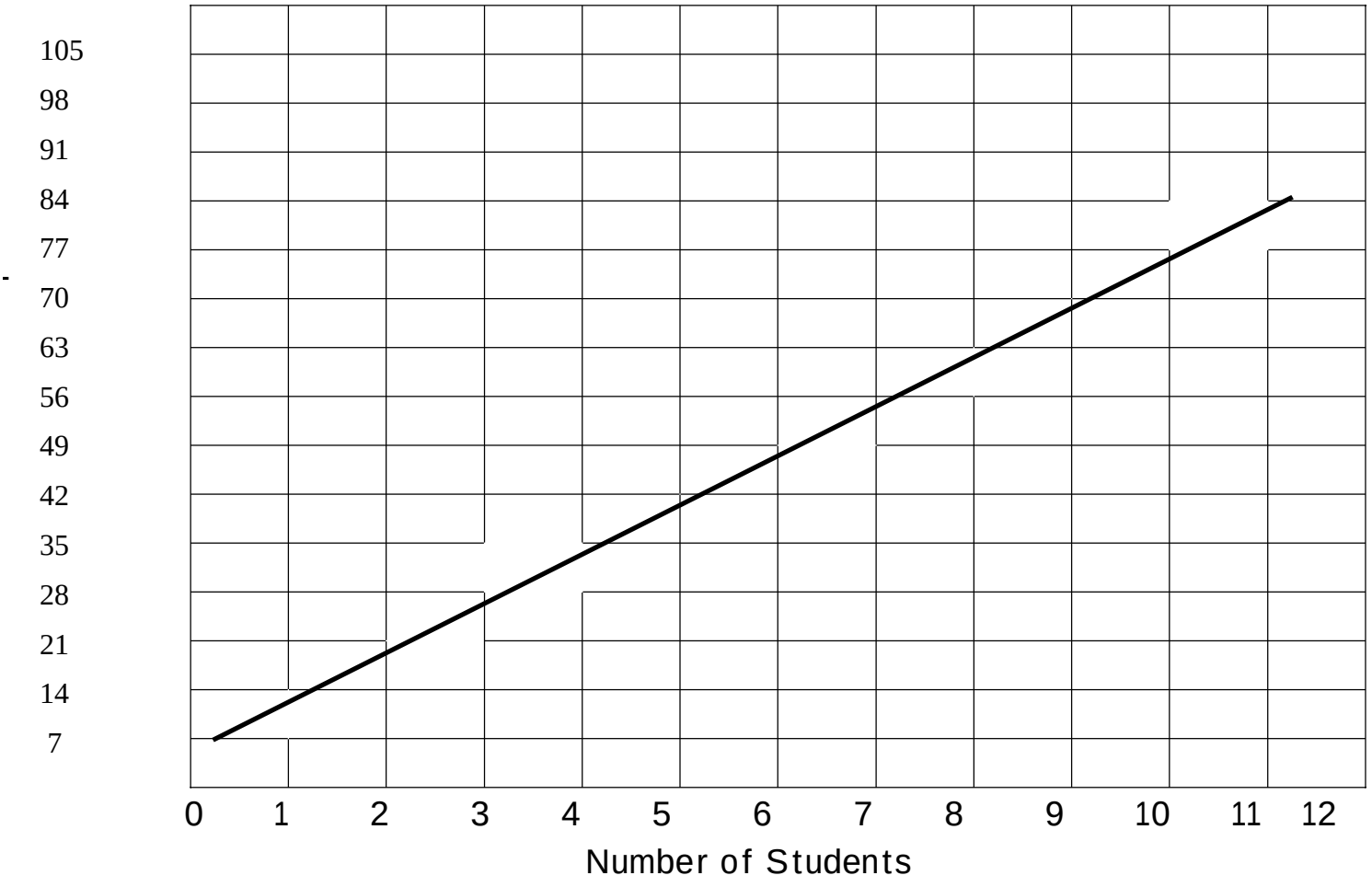
The students in Mrs. Stewart's class made quilts last week. They love making the quilts! Mrs. Stewart gave each student 7 fabric squares to attach to the quilt. If Mrs. Stewart had 12 students in her class, how many fabric squares were on the completed quilt?

Number of Students	Number of Squares
1	7
2	14
3	21
4	28
5	35
6	42
7	49
8	56
9	63
10	70
11	77
12	84

The class used a total of 84 fabric squares when making their quilt.

Using your information from the table, plot the ordered pairs to represent your data.

Mrs. Stewart's Class Quilt



Write a few sentences describing the pattern of your line plot. Be sure to use mathematical vocabulary in your answer.

Today, I used the table to plot the coordinates on a line graph. The line on my graph is diagonal. I know that if there were 13 students in Mrs. Stewart's class, there would be 91 fabric squares on the quilt.

Sample Unfinished Quilt Answers

The following response would receive a score of 3.

The last color square will be yellow. I figured this out because according to the pattern, all of the even number of squares will be yellow. Since there are a total of 40 squares in the quilt and 40 is an even number, the last square will be yellow.

OR

The last color square will be yellow. I figured this out because the core is ryby or abac. According to this pattern, yellow will always be the fourth color in the term. Forty is a multiple of four. Therefore, the last color will be yellow.

The following response would receive a score of 2.

The last color square will be yellow. I figured this out because all of the yellows are even numbers and forty is an even number.

The following response would receive a score of 1.

The last color square will be yellow. I know this because there are more yellow squares than red or blue squares. Therefore, the last square will be yellow.

The following response would receive a score of 0.

Last year I helped my aunt make a red, yellow, and blue quilt.